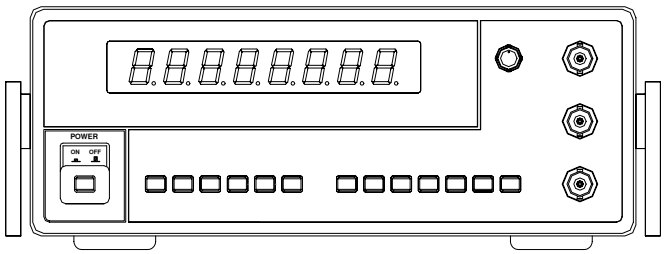
BENCHTOP INSTRUMENT

DAGATRON®

Operation Manual

8037 3.7GHz Frequency Counter
8030 3.0GHz Frequency Counter
8013 1.5GHz Frequency Counter
8030U 3.0GHz Frequency Counter (Universal)
8023 1.5GHz Frequency Counter (Universal)



DAGATRONICS CORPORATION

WARRANTY

Warranty service covers a period of one year from the date of original purchase.

In case of technical failure within one year, our service center or sales outlet free of charge will provide repair service.

We charge customers for repair after the one-year warranty period has been expired. Provided that against any failure resulted from the user's negligence, natural disaster or accident, we charge you for repairs regardless of the warranty period.

For more professional repair service, be sure to contact our service center or sales outlet.

Introduction

Thank you for purchasing our product. Electronic measuring instruments produced by us are high technology products made under strict quality control. We guarantee their exceptional precision and utmost reliability. For proper use of the product, please read this operation manual carefully.

Note

a. To fully maintain the precision and reliability of the product use it within the range of standard setting(temperature 10 °C~35 °C, humidity 45%~85%)
b. After turning of power, please allow a pre-heating period of as long as some 30 minutes before use.
c. This equipment should be used with a triple line power cord for safety.
d. For quality improvement the exterior design and specification of the product can be changed without prior notice.
e. If you have further questions concerning use, please contact our service center or sales outlet

Safety Summary

Please take a moment to read these operating instructions thoroughly and completely before operating this instrument. Pay particular attention to WARNINGS used for conditions and actions that pose hazard to the user and CAUTIONS used for conditions and actions that may damage the instrument.

- Always to inspect the instrument and other accessories for any sign of damage or abnormality before every use.
- Never ground yourself and keep your body isolated from ground.
- Never touch exposed wiring, connections or any live circuit conductors.
- Do not install substitute parts or perform any unauthorized modification to the instrument.
- Use caution when working above 60V DC or 30V AC rms. Such voltages pose a shock hazard.
- Remember that line voltage is present on some power input circuit points such as on-off switches, fuse, power transformers, etc., even when the equipment is turn off.
- Also, remember that high voltage may appear at unexpected points in defective equipment.

Safety Symbols

1. 

Protective earth (ground)

To identify any terminal which is intended for connection to An extemal conductor for protection against electric shock In case of a fault, or the terminal of a protective earth (ground) electrode.

2. 

Functional earth terminal on the rear panel.

3 

“IN” position of a bi-stable push control

To associate the “IN” position of a bi-stable push control With the corresponding function.

4. 

“OUT” position of a bi-stable push control

To associate the “OUT” position of a bi-stable push control With the corresponding function.

5. 

Alternation current

To indicate on the rating plate that the equipment is Suitable for altemating current only to identify relevant terminals.

6. 

Caution, risk of danger

7. 

Caution, risk of electric shock

CONTENT

1. PRODUCT DESCRIPTION

1-1. Introduction

This reciprocal FREQUENCY (UNIVERSAL) COUNTER series are microprocessor controlled instrument for frequency measurement at high resolution within a short period of 7 digit display with one second gate time due to uniquely developed LSI as well as the expanding/reciprocal system. It covers a frequency range from 0.1Hz to 3.7 GHz (8037: 3.7GHz, 8030,8030U: 3.0GHz, 8023,8013: 1.5GHz) based on 10MHz time base T.C.O (temperature controlled oscillator) and also featuring,

8023 / 8030U Frequency (Universal) Counter

- Trigger Function
- Time Interval Measurement Function
- Frequency Ratio Measurement Function
- Common or Separate Input Selection
- External Frequency Standard Input with 9 Digits LED Display
- Attenuator
- Check
- Period
- Total
- Low Pass Filter
- Line Filter

8037 / 8030 / 8013 Frequency Counter

- RPM(Rotation Per Minute) Measuring Function
- External Frequency Standard Input with 9 Digits LED Display
- Attenuator
- Check
- Period
- Total
- Low Pass Filter
- Line Filter

A self-test mode is also provided for a quick check of several facets of operation. Each operating mode can be selected by front panel push button switches with automatic decimal points and indicators. The high accuracy, sensitivity and versatility of this counter make it an extremely valuable instrument to the scientist, engineer, experimenter and communications technician. Light weight and compact size make it practical for use by the hobbyist or field technicians.

1-2. Technical Specifications

■ INPUT A CHARACTERISTICS

- FREQUENCY RANGE : 0.1Hz to 100MHz (DC Coupled)
  30Hz to 100MHz (AC Coupled)
- SENSITIVITY : 0.1Hz to 100MHz: 30mV
- COUPLING : AC or DC Selectable
- IMPEDANCE : 1 M Ω Resistance, Shunted by < 40pF
- ATTENUATOR : x 1 or x 10 Switch Selectable
- LOW PASS FILTER : -3dB Point of approx.100KHz, Switch Selectable
- **TRIGGER LEVEL : + 350mV to - 350mV (PRESET 0V)**
  <8023, 8030U only>
- **SLOPE : Positive or Negative Slope Switch Selectable**
  <8023, 8030U only>

* NOTE: Trigger error is typically ±0.3% of reading by the number of cycles averaged for input signals having better than 40dB S/N ratio and greater than 100mV amplitude.

- RESOLUTION AND NUMBER OF DISPLAYED DIGIT

Time Base Selector	INT	EXT	INT	EXT	INT	EXT	INT	EXT
Gate Time	0.01S		0.1S		1S		10S	
Number Of Displayed Digit	5	6	6	7	7	8	8	9
Frequency (Input A,B)	RESOLUTION							
0.1 Hz-0.99 Hz	10 uHz	1 uHz	1 uHz	0.1 uHz	0.1 uHz	10nHz	10nHz	1nHz
1 Hz-9.9 Hz	0.1 mHz	10 uHz	10 uHz	1 uHz	1 uHz	0.1 uHz	0.1 uHz	10nHz
10 Hz-99 Hz	1 mHZ	0.1 mHz	0.1 mHz	10 uHz	10 uHz	1 uHz	1 uHz	0.1 uHz
100 Hz-999 Hz	10 mHz	1 mHz	1 mHz	0.1 mHz	0.1 mHz	10 uHz	10 uHz	1 uHz
1 KHz-9.9 KHz	0.1 Hz	10 mHz	10 mHz	1 mHz	1 mHz	0.1 mHz	0.1 mHz	10 uHz
10 KHz-99 KHz	1 Hz	0.1 Hz	0.1 Hz	10 mHz	10 mHz	1 mHz	1 mHZ	0.1 mHz
100 KHz-999 KHz	10 Hz	1 Hz	1 Hz	0.1 Hz	0.1 Hz	10 mHz	10 mHz	1 mHZ
1 MHz-9.9 MHz	100 Hz	10 Hz	10 Hz	1 Hz	1Hz	0.1 Hz	0.1 Hz	10 mHz
10 MHz-99 MHz	1 KHz	100 Hz	100 Hz	10 Hz	10 Hz	1 Hz	1 Hz	0.1 Hz
100 MHz	10 KHz	1 KHz	1 KHz	100 Hz	100 Hz	10 Hz	10 Hz	1 Hz

- ACCURACY : ± Time base Error ± Resolution(Table 1)
- PERIOD RANGE : 10 nS to 10 S
- DISPLAY : n. u. m., Sec with decimal point
- TOTAL RANGE : DC to 30 MHz
  CAPACITY : 0 to 999 999 999
  OVER FLOW : “OF”
- RPM RANGE : 6 to 600 x 10^7 RPM , OVER FLOW : “OF”
  <8013,8030,8037 only>

• MAX. INPUT VOLTAGE LEVEL

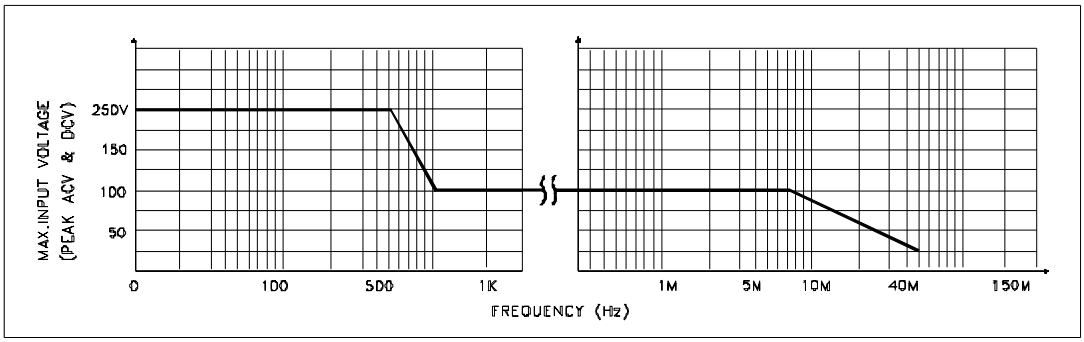


FIG 1. MAX. Input Level. (input A,B)

■ INPUT B. CHARACTERISTICS <8023, 8030U>

• FREQUENCY RANGE : 0.1Hz to 100MHz (DC Coupled)
30Hz to 100MHz (AC Coupled)
• SENSITIVITY : 0.1Hz to 100MHz: 30mV
• COUPLING : AC or DC Selectable
• IMPEDANCE : 1 MΩ Resistance, Shunted by < 40pF
• ATTENUATOR : x 1 or x 10 Switch Selectable
• LOW PASS FILTER : -3dB Point of 100KHz, Switch Selectable
• SLOPE : Positive or Negative Switch Selectable

* Resolution and Number of displayed digit (Table 1): Same as INPUT A
* Max. INPUT VOLTAGE LEVEL (FIG 1): Same as INPUT A

■ TIME INTERVAL(A→B) <8023, 8030U>

• RANGE : 0.1 uSec-0.1Sec(10Hz-10MHz)
• LSD : 100nSec
• RESOLUTION : ± LSD ± Trigger Error*
• ACCURACY : ± LSD ± Trigger Error ±Time base error x T.I
• MULTIPLIER : 1,10,100,1000 (*100,1000 : less than 100Hz)

■ RATIO(A/B) <8023, 8030U>

• RANGE : 0.1Hz to 10MHz(input A)
: 0.1Hz to 10MHz(input B)
• RESOLUTION : ± LSD ±(B TrIg. ERROR x FREQ. A)/N
• ACCURACY : ±1 COUNT of A ± B TRIG. ERROR x FREQ. A.

■ INPUT C. CHARACTERISTICS

• FREQUENCY RANGE & SENSITIVITY

Model	Frequency Range	Sensitivity
8013, 8023	80MHz – 1.5GHz	35mVrms from 80 MHz to 1.1 GHz 70mVrms from 1.1GHz to 1.5 GHz
8030, 8030U	80MHz – 3.0GHz	25mVrms from 80 MHz to 150 MHz 20mVrms from 150MHz to 2.0 GHz 60mVrms from 2.0GHz to 3.0GHz
8037	80MHz – 3.7GHz	10mVrms from 80 MHz to 2.0GHz 20mVrms from 2.0GHz to 3.0GHz 30mVrms from 3.0GHz to 3.2GHz 40mVrms from 3.2GHz to 3.5GHz 70mVrms from 3.5GHz to 3.7GHz

• COUPLING : AC only
• IMPEDANCE : 50 Ω ±5%
• MAX. INPUT LEVEL : 3 Vrms sine wave

• RESOLUTION AND NUMBER OF DISPLAYED DIGIT

Time Base Selector	INT	EXT	INT	EXT	INT	EXT	INT	EXT
Gate Time	0.01S		0.1S		1S		10S	
Number Of Displayed Digit	5	6	6	7	7	8	8	9
Frequency (Input C)	RESOLUTION							
80 MHz-99 MHz	1 KHz	100 Hz	100 Hz	10 Hz	10 Hz	1 Hz	1 Hz	0.1 Hz
100 MHz-999 MHz	10 KHz	1 KHz	1 KHz	100 Hz	100 Hz	10 Hz	10 Hz	1 Hz
1 GHz-3.7 GHz	100 KHz	10 KHz	10 KHz	1 KHz	1 KHz	100 Hz	100 Hz	10 Hz

(Table 2)

■ TIME BASE CHARACTERISTICS

• TYPE : TCO (Temperature controlled oscillator)
• FREQUENCY : 10.000000 MHz
• STABILITY : ±1 PPM(±1 count)
• LINE VOLTAGE STABILITY : Less than ± 1 PPM with ± 10% line voltage variation.
• TEMPERATURE STABILITY : ±5 PPM from 0°C to 50°C
• MAX. AGING RATE : ±5 PPM/year
• INT. STD. OUT : 10 MHz(internal standard frequency output)
• LEVEL : 1 Vpp or more.
• IMPEDANCE : Approx. 600Ω
• EXT. STD. IN : 10 MHz(external standard frequency input)
• LEVEL : 1.5 Vrms to 5Vrms
• IMPEDANCE : Approx. 600Ω

■ DISPLAY CHARACTERISTICS

- DISPLAY : Nine Digit 0.56" LED with M/n, K/u, Hz, m, Sec, G.T, Hold, and "OF" indicators. Function and Gate time: User Selected. "OF" Display Shown When Count exceeds 999 999 999
- HOLD : In Frequency and Period, TOTAL. Mode measurement in progress is stopped, and the last complete measurement is displayed. When Hold is released, a new measurement begins.
- GATE TIME : Dipending on input frequency
  < 10mS----------Somewhere between 0.9 and 9mS
  < 0.1S----------Somewhere between 9 and 90mS
  < 1S---------- Somewhere between 90 and 900mS
  < 10S----------Somewhere between 0.9 and 9S

⚠ NOTE: LAST MEASUREMENT DISPLAY WILL REMAIN FOR 10 SECONDS AFTER SIGNAL OFF.

■ DIMENSION AND WEIGHT

- Dimensions : 240(W) x 90(H) x 270(D)mm
- Weight : Approx. 2.5 kg.

1-3. Equipment Ratings

- Power : 115V/230V AC ±10% , 50-60 Hz, 15 W <8023, 8030U>
  115V/230V AC ±10% , 50-60 Hz, 9 W<8013,8030, 8037>
- Plug and Socket: 3 wire ac power plug and 3 wire outlet
- Fuse :

Input Voltage	Fuse
103 ~ 126V AC (50/60Hz)	F 0.5A / 250V
206 ~ 252V AC (50/60Hz)	F 0.2A / 250V

NOTE: AC Power is preset to 115V or 230V in factory according to the request of customer.

- Environmental conditions:
  - Indoor use only
  - Altitude up to 2000m
  - Temperature 5°C to 40°C
  - Maximum relative humidity 80% for temperature up to 30°C decreasing linearly to 50% relative humidity at 40°C
  - Pollution degree 2

1-4. Supplied Accessories

- User's Manual ----------1
- BNC cable ----------1
- Power cord----------1
- Spare Fuse----------1

*** Specifications are subject to change without notice.**

2. INSTALLATION

2-1. Initial Inspection

This instrument was carefully inspected both mechanically and electrically before shipment. It should be physically free of damage. To confirm this, the instrument should be inspected for physical damage in transit. Also, check for supplied accessories.

2-2. Connecting AC Power

This instrument requires 115V/ 230V AC (50-60 Hz) power socket with protective earth contact (PE-contact). If is available only a power socket without PE-contact (so a 2-conductor ac power) then a power socket with PE-contact must be installed before or the appliance should be provided with a PE-screw-terminal which is not soluble by hand and not soluble before 2-conductor power lines.

⚠ CAUTION

AC POWER OF THIS INSTRUMENT IS PRESET TO 115V OR 230V IN FACTORY ACCORDING TO THE REQUEST OF CUSTOMER. BEFORE POWERING ON THIS INSTRUMENT, CHECK AND MAKE SURE THE VOLTAGE OF THE POWER SOURCE IS SAME WITH THE MARKING OF UNIT.

2-3. Cooling and Ventilation

No special cooling and ventilation is required. However, the instrument should be operated where the ambient temperature is maintained.

2-4. Position

This instrument is built as a bench-type instrument with rubber feet and tilt stand in place. Stand-up angle can be adjusted by rotating angle of carrying handle.

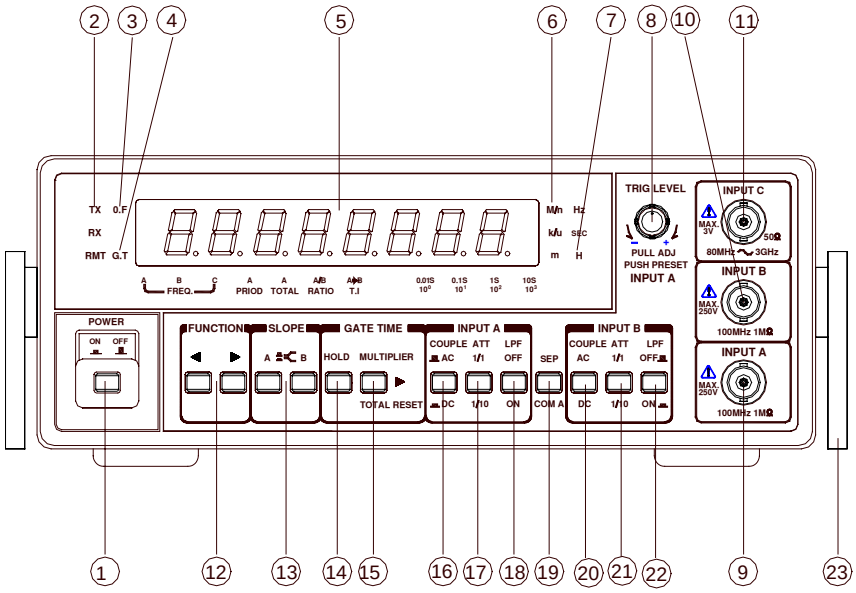
2-5. Warming-Up

Allow more than 20 minutes for the unit to warm up so that it is stabilized and ready for use.

3. OPERATION

3-1. Controls, indicators and connectors

3-1-1. 8023, 8030U Universal Counter



FIG(2) FRONT PANEL

① POWER SWITCH : Push in the unit ON and push out the unit power OFF.

② RS-232C INDICATOR: TX(transmitting), RX(receiving) blinking(OPTION)

③ OVER FLOW INDICATOR : OF is displayed when overflow.

④ GATE INDICATOR : The gate light, when lit, indicates the main gate is open and measurement in progress.

⑤ DISPLAY : 9 digit(O.56") green LED display used for all read readings.

NOTE: LAST MEASUREMENT DISPLAY WILL REMAIN FOR 10 SECONDS AFTER SIGNAL OFF.

⑥ UNIT INDICATOR : When lit, indicates that the frequency displayed is in KHz or MHz, and period is in n, u or mSec.

⑦ HOLD INDICATOR : When lit, engaged the hold function.

⑧ TRIG. LEVEL VR : Adjusts trigger threshold level on the input A input signal. Pushing the knob in (preset) sets this level at the mid-point of a symmetrical sinewave input. Pulling the knob out and rotating it varies the level from negative to positive around the mid point.

⑨ INPUT A, BNC : Input for frequency measurements below 100MHz. Female BNC connector terminated in 1 MΩ input resistance, Shunted by < 40pF capacitance.

⑩ INPUT B, BNC : Input for frequency measurements below 100MHz Female BNC connector terminated in 1 M Ω input resistance, shunted by < 40pF capacitance.

⑪ NPUT C, BNC : Input for frequency measurements above 80MHz Female BNC connector terminated in 50Ω.

⑫ FUNCTION SWITCH : Select the desired operating mode.

a. FREQ. A. When this mode is selected, the counter reads the frequency of the input A.
Resolution is selected using the GATE TIME.

b. FREQ. B. When this mode is selected, the counter reads the frequency of the input B. Resolution is selected using the GATE TIME.

c.FREQ. C: When this mode is selected, the counter reads the frequency of the input C. All readings are in MHz.

d. PERIOD A. When this mode is selected, the counter read the period of the input A Resolution is selected using the GATE TIME.

e. TOTAL A. When this mode is selected, the unit counts cycles of the input A signal and continuously displays that count.

f. T.I (A→B). When this mode is selected, the unit measures the time interval from an edge of the

input A signal to an edge of the input B signal. Positive going or Negative going edge of each signal is selected By the slope switches.

g. RATIO (A/B). When this mode is selected, the unit measures the ratio of input A frequency to the input B frequency.

⑬ SLOPE SWITCH : Selects positive going or negative going edge of inputA, B signal for triggering. When pushed in, negative going edge is selected; when pushed out, positive going edge is selected.

⑭ HOLD SWITCH : In hold function the display held but the counters continue to increment. When the hold is released, the display is updated and resumes counting.

⑮ GATE TIME SWITCH : This switch selects the degree of resolution of the display in all modes except TOTAL.

⑯ INPUT A COUPLING SWITCH :
The switch is used to select the input A coupling mode AC or DC.

⑰ INPUT A ATTENUATOR SWITCH :
When this switch is set to x 10 (pushed in) the inputA is attenuated 10 :1 before application to the counter with the switch set to x 1 (pushed out), the input A signal is applied.
The attenuator has no effect on the input C.

⑱ INPUT A LOW PASS FILTER :
With this switch pushed in, the input A is routed through a SWITCH(LPF) low-pass filter with-3dB point of approximately 100KHz. When it is released, the input A signal is applied to the counter.

⑲ COM A/SEP. : COMMON. or SEPARATION for INPUT A,B

⑳ INPUT B COUPLING SWITCH :
The switch is used to select the input B coupling mode AC or DC.

㉑ INPUT B ATTENUATOR. SWITCH :
When this switch is set to x 10 (pushed in) the

input B is attenuated 10 :1 before application to the counter with the switch set to x 1 (pushed out), the input B signal is applied.
The attenuator has no effect on the input C.

㉒ INPUT B LOW PASS FILTER :

With this switch pushed in, the input B is routed through a SWITCH(LPF) low-pass filter with-3dB point of approximately 100KHz. When it is released, the input B signal is applied to the counter.

㉓ TILT STAND : Pull out to adjust Tilt.

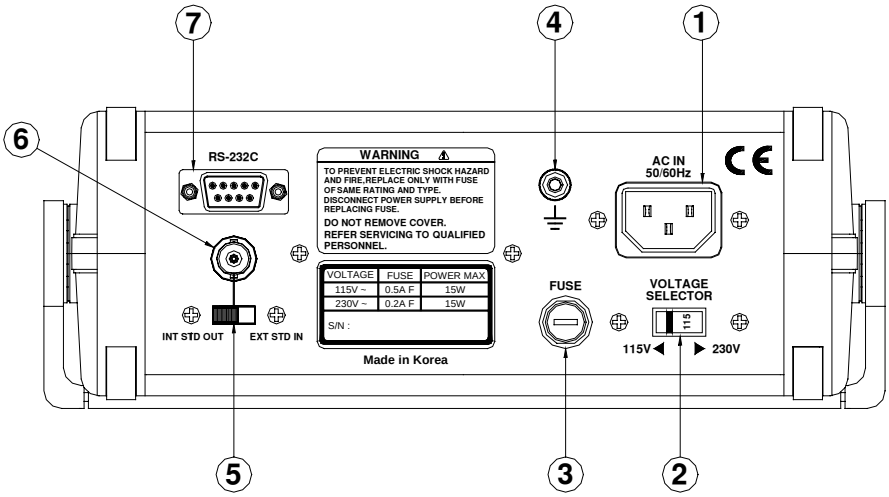


FIG (3) REAR PANEL

① AC INLET : AC power input connector

② VOLTAGE SELECTOR : Selects the AC Power (115V or 230V)

③ FUSE HOLDER : Replace fuse by unscrewing.

④ GROUND TERMINAL

⑤ INT/EXT TIME BASE SELECTOR:

Selects the source of the time base. EXT.STD. IN sets up BNC ⑤ as a nominal 600Ω input impedance path for an external 10 MHz time base signal. INT. STD. OUT sets up BNC ⑤ to monitor the internal time base signal.

⑥ INT/EXT TIME BASE BNC:

Provides a connector through which the internal time base signal can be monitored or through which an external time base signal can be applied (see item ② above). The external signal should have a voltage range of 1.5 V~5 V rms.

⑦ RS-232C CONNECTOR: Connector for serial interfacing with a computer.

3-1-2. 8013, 8030 , 8037 Frequency Counter

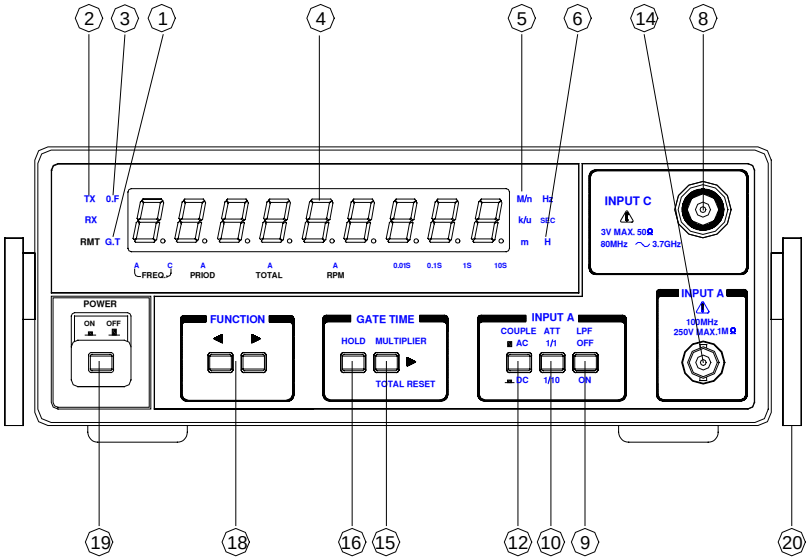


FIG.(4) FRONT PANEL

① GATE INDICATOR : The gate light, when lit, indicates the main gate is open and measurement in progress.

② RS-232C INDICATOR : TX(transmitting), RX(receiving) blinking(OPTION)

③ OVER FLOW INDICATOR : OF is displayed when overflow.

④ DISPLAY : 9 digit(O.56 “) green LED display used for all read-readings.

NOTE: LAST MEASUREMENT DISPLAY WILL REMAIN FOR 10 SECONDS AFTER SIGNAL OFF.

⑤ UNIT INDICATOR : When lit, indicates that the frequency displayed is in MHz ,KHz, Hz and period is in. n. u. Sec.

⑥ HOLD INDICATOR : When lit, engaged the hold function.

⑧ INPUT C, BNC : Input for all frequency measurements above 80 MHz Female BNC connector terminated in 50Ω.

⑨ LOW PASS FILTER : With this switch pushed in, the input A is routed through a low-pass filter with a -3 dB point of approximately 100 KHz. When it is released, the input A signal is applied to the counter.

⑩ ATT. SWITCH : When this switch is set to x 10(pushed in) the input A is attenuated 10:1 before application to the counter with the switch set to x 1(pushed out), the input A signal is applied unattenuated. The attenuator has no effect on the input C.

⑫ COUPLE. SWITCH : The switch is used to select the input coupling, mode AC or DC.

⑭ INPUT A, BNC : Input for frequency measurements below 100 MHz and all PERIOD, measurement. Female BNC connector terminated in 1 MΩ. input resistance, shunted by < 40 pF capacitance.

⑮ GATE TIME SWITCH : This switch select the degree of resolution of the display in all modes except TOTAL.

⑯ HOLD SWITCH : In hold function, the display held but the counter continue to increment. When the hold is released, the display is updated and resumes counting.

⑱ FUNCTION SWITCH : Select the desired operating mode.

a. FREQ. A : When this mode is selected, the counter reads the frequency of the Input A. Resolution is selected using the GATE TIME.

b. FREQ. C : When this mode is selected, the counter reads the frequency of the input C. All readings are in MHz.

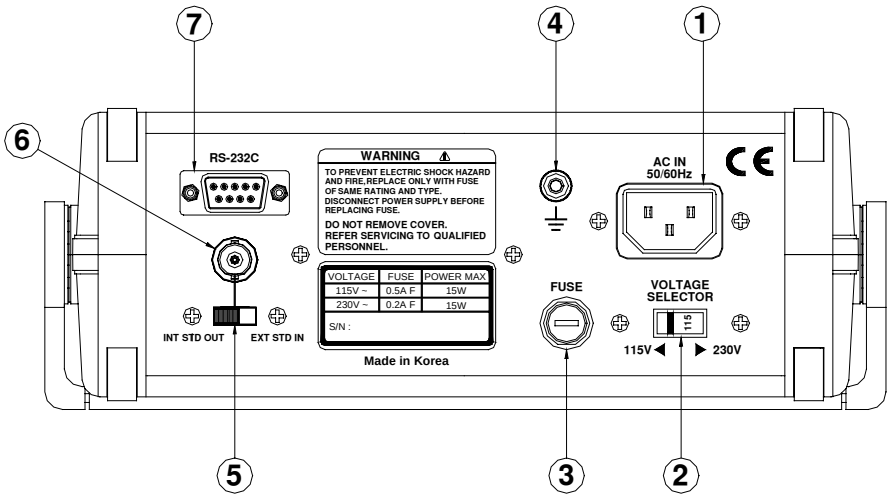
c. PERIOD A : When this mode is selected, the counter read the period of the input A. Resolution is selected using the GATE TIME.

d. TOTAL A : When this mode is selected, the unit counts cycles of the input A signal and continuously displays that count.

e. RPM A : When this mode is selected, the unit displays the RPM(rotation per minute) of the input A signal.

⑲ POWER SWITCH : Push in the unit ON and push out the unit power OFF.

⑳ TILT STAND : Pull out to adjust Tilt.



FIG(5) REAR PANEL

① AC INLET : AC power input connector

② VOLTAGE SELECTOR : Selects the AC Power (115V or 230V)

③ FUSE HOLDER :Replace fuse by unscrewing.

④ GROUND TERMINAL.

⑤ INT/EXT TIME BASE SELECTOR:

Selects the source of the time base. EXT.STD. IN sets up BNC ⑤ as a nominal 600 input impedance path for an external 10 MHz time base signal. INT. STD. OUT sets up BNC ⑤ to monitor the internal time base signal.

⑥ INT/EXT TIME BASE BNC:

Provides a connector through which the internal time base signal can be monitored or through which an external time base signal can be applied (see item ② above). The external signal should have a voltage range of 1.5 V~5 V rms.

⑦ RS-232C CONNECTOR: Connector for serial interfacing with a computer.

3-2. Operating Instruction

Below is the basic operating information needed for frequency counter.

a. Connect the unit to AC power cord into receptacle on rear panel and plug into AC inlet.
b. To Turn on equipment, push power on-off switch on.
c. Set the function indicator position to FREQ A and Gate time indicator to 1 Sec position.

⚠ CAUTION

1. APPLICATION OF INPUT VOLTAGES HIGHER THAN THE LIMITS LISTED IN THE SPECIFICATIONS SECTION MAY DAMAGE THE COUNTER. BEFORE APPLYING ANY SIGNAL TO THE INPUTS, MAKE CERTAIN THAT IT DOES NOT EXCEED THESE SPECIFIED MAXIMUMS.

2. FREQUENCY COUNTER GROUND POINTS ARE CONNECTED DIRECTLY TO EARTH GROUND. ALWAYS CONNECT FREQUENCY COUNTER GROUND ONLY TO GROUND POINTS IN THE CIRCUIT UNDER TEST.

3-3. Frequency Measurements

3.3.1 INPUT A, B (0.1Hz ~ 100MHz)

a. Apply the signal to be measured to the input A and/or **B (8023, 8030U only)** BNC.
b. Set the FREQ. A and/or **B (8023, 8030U only)** of function switch.
c. Select the degree of resolution desired, using the gate time selector switch.
d. Frequency is given by the display. The gate indicator lights while each measurement in progress, and the display is updated at the end of each measurement interval.
e. Engaging the hold switch “freezes” the display at the existing reading, When hold is released, the display is updated and resumes counting.
f. If necessary, engage the attenuator switch When set to x 10 (pushed in), this switch attenuates the input A and/or B(**8023, 8030U only**) signal by a factor of approximately 10 before application to the counter. This helps prevent miscounting caused by noisy or improperly terminated high amplitude signals.
g. If necessary, engage the LPF (low pass filter) switch This route the input A and/or B through a low pass filter (-3 dB point of approximately 100 KHz) before application to the frequency counter. This helps eliminate counting errors in low frequency measurements by minimizing effects of high frequency noise present on the input.
h. When measurement the lower cut-off frequency (10 Hz), pushed in DC coupling position.

3.3.2 INPUT C

8013, 8023: 80MHz to 1.5GHz
8030, 8030U: 80MHz to 3.0GHz
8037 : 80MHz to 3.7GHz

⚠ CAUTION
THE MAXIMUM INPUT LIMIT TO THIS INPUT IS 3 Vrms MAXIMUM OVER THE INPUT FREQUENCY RANGE. THE X 10 ATTENUATOR DOES NOT APPLY.

a. Apply the signal to be measured to the input C. BNC.
b. Set the function indicator to the FREQ. C position.
c. Select the degree of resolution desired, using the gate time switch.
d. Frequency is given by the display. The indicator lights while each measurement in progress.

e. Engaging the hold switch “freezes” the display at the existing reading, When hold is released, the display is updated and resumes counting.
f. The attenuator and LPF coupling switch have no effect in input C.

3-4. Period Measurements

a. Apply the signal to be measured to the input A BNC.
b. Select the degree of resolution desired, using the gate time switch.
c.Period is given by the display. The gate indicator lights while each measurement is in progress.
d. attenuator, low pass fitter, coupling switch application is same as frequency measurements mode.

3-5. Total Measurements

The totalize mode is used to count the total number of events occurring during a specific time period. Maximum frequency is 30 MHz.
a. Set the totalize mode. Any gate and units setting is ignored.
a. Apply the signal to be measured to input A , and then the counter display is the count continually. Maximum count is 999999999. if this is exceed the overflow message display as ”OF”
b. Low pass filter and attenuator, coupling switch application is same as frequency measurements mode.

⚠ NOTE
THE HOLD SWITCH MAY BE USED TO BE LATCH THE DISPLAY. HOWEVER, THE COUNTER TO INCREMENT AND WHEN THE HOLD IS RELEASED, THE UPDATE COUNT IS DISPLAY.

3-6. RPM (Rotation Per Minute) Measurement <8013, 8030, 8037>

a. Apply the signal to be measured to the input A BNC, and then the counter displays the RPM. Maximum count is 999999999. If this is exceed, the overflow message displays as ”OF”
b. Low pass filter and attenuator, coupling switch application is same as frequency measurements mode.

3-7. Time Interval Measurements(A→B) <8023, 8030U>

In time interval mode, unit measures the elapsed time from a selected edge of the input A waveform to a selected edge of the input B waveform. For a stable reading, the two input signals should be related to each other such that this time interval remains reasonably constant from one measurement to the next. For example, two

digital waveforms derived from the same clock would be suitable; two arbitrary frequencies from separate function generators would not.

f. Connect the signal to be measured to the input A and input B.
g. Set the T.I(A→B) of function switch. The switch label serves as a reminder that the measurement starts at the input A edge and stops at the input B edge.
h. Select desired edge of each waveform using the input A, and input B slope switches push switch in for negative-going edge, leave out for positive-going edge.
i. Set a trigger level control to preset (Push In). This ensures that both input A and input B are triggering at the same level (approximately the average) on their respective waveforms.

j. Select the degree of resolution desired, using the gate time switch
k. Time interval is given by the display, the gate indicator lights while each measurement is in progress, and the display is updated at the end of each measurement interval.
l. Press the hold switch, “freezes” the display at the existing reading when hold is released, a new measurement begins (Gate Indicator Lights), but the display continues to hold the old reading until the new measurement is completed.

3-8. Frequency Ratio Measurements (A/B) <8023,8030U>

In this mode of operation, the counter displays the ratio of the frequency applied to input A to the frequency applied to input B. The input A frequency should preferably be equal to or greater than that of input B. And both frequencies must be within the limits given in the "SPECIFICATIONS" section. Frequency ratio is determined by counting the number of input A cycles occurring during a specified number of input B cycles (1.10.100.1000) and applying the result, with a proper decimal point, to the display.

a. Connect a signals to be measured to the input A and input B.

⚠ NOTE

BOTH INPUTS MAY BE CONNECTED TO THE SAME SIGNAL FOR A RATIO OF 1.000000 AT THE GATE TIME 1 SEC. THE UNIT INDICATORS ARE OFF BECAUSE THE READING DISPLAYED IS RATIO.

b. Set the ratio A/B of function switch.
c. Select the resolution desired using the gate time switches.
d. Frequency ratio is given by the display the gate indicator lights while each measurement is in progress, and the display is updated at the end of each measurement interval.

e. Press the hold switch "freezes" the display at the existing reading. When hold is released, a new measurement begins, but the display continues to hold the old reading until the new measurement is completed.

3-9. Use of RS-232C Serial Interfacing

1) FC/UC RS-232C D-SUB CABLE ASS'Y PIN CONNECTION

(1) Used Pin No.: 2,3,4,7 from 9 pin

(2) Details of Pin

Pin No. 2: TXD
Pin No. 3: RXD
Pin No. 4: DTR(Data to ready), DC Power from P/C (High 12V)
Pin No. 7: RTS(Ready to send), DC Power from P/C (Low -12V)

**** The pin 4(DTR) and Pin7(RTS) should be "enabled".**
If not, make to be "Enabled" by command in used program.
And then DC Power (Pin 4: +12V, Pin 7: -12V) will supplied from computer to Frequency counter.

2) Hardware/Software Requirements

. IBM PC/XT/AT or compatible computer
. Microsoft Windows
. Serial port for connection with counter

3) Output Data Formats

(1) Baud rate : 9600BPS / 1 start bit (0) / 8 data bit / 1 stop bit (1) / NONE PARITY

(2) To Frequency counter

Command	Parameter	Terminate Code
'H' : HOLD	'0' : OFF '1' : ON '2' : TOGGLE	CR (0DH)
'G' : GATE	'0' : 0.01 SEC '1' : 0.1 SEC '2' : 1 SEC '3' : 10 SEC	CR (0DH)
'D' : DATA REQUEST	DON'T CARE	CR(0DH)
'F' : FUNCTION SET	N*	CR(0DH)
'R' : REMOTE	'0' : OFF '1' : ON	CR(0DH)

N*=	0	1	2	3	4	5	6	7
U/C	FA	FB	FC	PERIOD	TOTAL	NC	RATIO	TI
F/C	FA	NC	FC	PERIOD	TOTAL	RPM	NC	NC

(3) From Frequency counter

DATA	UNIT	
10BYTES include dp	**4bytes**	**CR**

4) Installing Program and using the software
Refer to "Readme" file on Software diskette supplied with unit.

Example: Command for Visual Basic

```
Comm1.CommPort = 1
Comm1.Settings = "9600,n,8,1"
Comm1.DTREnable = True 'pin4 12v
Comm1.RTSEnable = False 'pin7 -12v
Comm1.PortOpen = True

Comm1.Output = Trim("F0CR")    'set function FA
 Call Delay500ms
 Call Delay500ms

 Comm1.Output = Trim("G1CR")   'set Gate 0.1s
 Call Delay500ms
   Call Delay500ms

Comm1.Output = Trim("D1CR")   'Date request
   Call Delay500ms
   Call Delay500ms
 txtReceive.Text = Trim(Comm1.Input) ' display the frequency.
```

4. MAINTENANCE

⚠ CAUTION

IT IS ESSENTIAL FOR SAFETY TO PROPERLY MAINTAIN AND SERVICE THIS INSTRUMENT

⚠ **WARNING**

VOLTAGES WITHIN THIS INSTRUMENT ARE SUFFICIENTLY HIGH TO ENDANGER LIFE. COVERS MUST NOT BE REMOVED EXCEPT BY PERSONS QUALIFIED AND AUTHORIZED TO DO SO AND THESE PERSONS SHOULD ALWAYS TAKE EXTREME CARE ONCE THE COVERS HAVE BEEN REMOVED.

4-1. Fuse Replacement

- Disconnect and remove all connections from any live power source.
- Unscrew fuse holder by screw driver.
- Locate the defective fuse and remove it by gently pulling-out.
- Install a new fuse of the SAME SIZE AND RATING.
- Screwing fuse holder.

⚠ **CAUTION**

MAKE SURE THAT THE RATED AND SPECIFIED FUSES ARE USED FOR REPLACEMENT.

4-2. Adjustment And Calibration

It is recommendable to regularly adjust and calibrate this instrument. Qualified and authorized personnel only should execute performance and procedures

4-3. Cleaning and decontamination

The instrument can be cleaned with a soft clean cloth to remove any oil, grease or grime. Never use liquid solvents or detergents. If the instrument gets wet for any reason, dry the instrument using low-pressure clean air at less than 25 PSI. Use care and caution around the window cover areas where water or air could enter into the instrument while drying.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

5. OTHERS

5-1. BNC Cable Considerations

Accuracy of radio frequency measurements can be affected by connections between signal source and counter. Main considerations are standing waves and shunt cable capacitance.

Standing wave is usually present due to reflections when a transmission line is not terminated in its characteristic impedance. These standing waves may cause damage to the signal source or produce inaccurate measurements, and their effects increase as cable length reaches one-fourth of the wavelength for the frequency being measure. Standing wave can be minimized by keeping cable lengths short, and more important, providing a proper termination.

The cable's characteristic impedance and the terminating impedance should match the source impedance. For example, for a source impedance of 50Ω, use 50Ω coaxial cable terminated with a 50Ω resistive load.

Use DC blocking capacitor in situations where bias voltage or other DC voltages could be affected by the termination resistor. Shunt cable capacitance, which can cause undesirable signal attenuation, increases with increased cable length. It is recommended that for radio frequency measurements, the cable be no longer than three feet (90 cm), to keep shunt capacitance within acceptable limit.

In 50Ω systems the internal 50Ω input termination of the input B. BNC minimizes reflections and the resulting standing waves. Thus, the need for an external termination is eliminated. Also, shunt capacitance has a much lesser effect at this BNC then at the input A, and the above restriction on cable length is reduced. However, prescale measurements must always be taken from a 50Ω point in the circuit under test.

5-2. Use of Attenuator Probes

Input A resistance (1 M Ω) and input capacitance (< 40 pF) are independent of the ATT switch. To decrease loading, a high impedance oscilloscope probe such as the following may be used with input A. Use the probe in the x 10 position whenever possible for less circuit loading.

⚠ NOTE

DO NOT USE A 10:1 PROBE WITH THE INPUT C, THE PROBE IS DESIGNED FOR 10:1 ATTENUATOR WITH A COUNTER INPUT RESISTANCE OF 1 M Ω. THE 50 Ω TERMINATION OF THE INPUT C WOULD RESULT IN UNACCEPTABLY HIGH ATTENUATION.

5-3. Line Frequency Measurements

Use of the attenuator, low pass filter, and/or x10 probe is advisable when measuring line frequency because the high amplitude signal and noise can cause wrong counting.

⚠ WARNING

USE CAUTION IN MEASURING THE LINE FREQUENCY OF AN AC OUTLET. USING THE PROBE TIP ONLY, MEASURE BOTH SIDES OF THE LINE. THE GROUND SIDE WILL GIVE A ZERO READING AND THE HOT SIDE WILL PROVIDE THE DESIRED MEASUREMENT. DO NOT USE THE "GROUND "LEAD OF THE PROBE. REMEMBER THAT THE CHASSIS OF THE COUNTER AND THE “GROUND” LEAD OF THE PROBE ARE ALREADY AT EARTH GROUND (VIA THE 3-WIRE POWER CORD OF THE INSTRUMENT). TOUCHING THE “GROUND "LEAD TO THE 'HOT" SIDE OF THE LINE WOULD PLACE A DIRECT SHORT ON THE POWER LINE THROUGH THE PROBE CABLE, RESULTING IN POSSIBLE INJURY AND DAMAGE TO THE PROBE CABLE.

This is marking shown on the product or its literature, indicates that it should not be disposed with other household wastes at the end of its working life.

To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate this from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take this item for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract.

This product should not be mixed with other commercial wastes for disposal.

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